UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

IN RE POLYMEDICA CORPORATION SECURITIES LITIGATION	)	CIVIL ACTION NO. 00-12426-WGY

MEMORANDUM AND ORDER

YOUNG, D.J. September 28, 2006

I. INTRODUCTION

This Memorandum addresses the certification of a class from the period of January 1, 2001, to August 21, 2001 (the "Contested Period"). The issue of class certification already has been before Judge Robert E. Keeton, resulting in a thorough memorandum opinion that certified a class from October 26, 1998, to August 21, 2001. In re PolyMedica Corp. Secs. Litig., 224 F.R.D. 27 (D. Mass. 2004). In an equally thorough decision, the First Circuit reversed Judge Keeton in part and remanded the issue for further proceedings as to the Contested Period. In re PolyMedica Corp. Secs. Litig., 432 F.3d 1 (1st Cir. 2005). Due to Judge Keeton's retirement after a distinguished career,[1] the case was reassigned to this session of the Court.

[1] See Shelley Murphy, Keeton Retires from US Court: Handled Many Big Cases in 27 Years on Bench, Boston Globe, Sept. 10, 2006, at B2.

The many prerequisites to class certification set forth in Federal Rule of Civil Procedure 23(a) -- numerosity, commonality, typicality, and adequacy of representation -- have already been addressed in Judge Keeton's original ruling, which was left undisturbed in this respect by the First Circuit. PolyMedica, 224 F.R.D. at 35-37.

The sole issue for further adjudication here is whether Rule 23(b)(3) can be satisfied in the circumstances of this case. Rule 23(b)(3) provides that a class action can be maintained if "the court finds that the questions of law or fact common to the members of the class predominate over any questions affecting only individual members, and that a class action is superior to other available methods for the fair and efficient adjudication of the controversy."

In the context of securities fraud allegations, the nature of Rule 23(b)(3) analysis is quite particularized. Securities frauds, like all frauds, entail proof of reliance. See Dura Pharms., Inc. v. Broudo, 544 U.S. 336, 341-42 (2005).

> While reliance is typically demonstrated on an individual basis, the Supreme Court has noted that such a rule would effectively foreclose securities fraud class actions because individual questions of reliance would inevitably overwhelm the common ones under Rule 23(b)(3). [Basic, Inc. v. Levinson, 485 U.S. 224, 242 (1988).]
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> To avoid this result, the Supreme Court has recognized the fraud-on-the-market theory, which relieves the plaintiff of the burden of proving individualized reliance on a defendant's misstatement, by permitting a rebuttable presumption that the

> plaintiff relied on the "integrity of the market price" which reflected that misstatement.

PolyMedica, 432 F.3d at 7.

> "[T]he fraud on the market theory is based on the hypothesis that, in an open and developed securities market, the price of a company's stock is determined by the available material information regarding the company and its business," including any available material misstatements. [Basic, 485 U.S.] at 241. Since investors who purchase or sell stock do so in reliance on "the integrity of the market price," they indirectly rely on such misstatements because they purchase or sell stock at a price which necessarily reflects that misrepresentation.

Id. (some citations omitted). "Before an investor can be presumed to have relied upon the integrity of the market price, however, the market must be 'efficient.'" Id. (citing Basic, 485 U.S. at 248 n.27).

Establishing the First Circuit's standard of "efficiency" for the first time, that court in PolyMedica concluded that Judge Keeton's analysis was inconsistent with that standard and remanded the case for consideration under it. Thus, the sole issue for this Court to resolve is whether the market for PolyMedica stock was "efficient" as defined by the First Circuit in PolyMedica.

II. DISCUSSION

A. "Efficiency" in the First Circuit

In its PolyMedica decision, the First Circuit ruled that, "[f]or application of the fraud-on-the-market theory, we conclude

that an efficient market is one in which the market price of the stock fully reflects all publicly available information." 432 F.3d at 14. "By 'fully reflect,' we mean that market price responds so quickly to new information that ordinary investors cannot make trading profits on the basis of such information." Id. at 19. The court stressed that this definition speaks only to "information efficiency," not "fundamental value efficiency" -- i.e., the market price must rapidly reflect all public information, but not necessarily be the best possible estimate of the stock's actual worth. Id. at 14-17.

B. Level of Inquiry

In addition to defining market efficiency, the First Circuit in PolyMedica also joined the majority of circuits with regard to the appropriate scope and level of inquiry for a district court when determining market efficiency. The court ruled that it is acceptable for a district court to go beyond the pleadings when ruling on a Rule 23 motion. Id. at 5-6. Though a "mini-trial on the merits . . . must not happen," id. at 16, there must be a "rigorous analysis of the prerequisites established by Rule 23 before certifying a class," id. at 6 (quoting Smilow v. Southwestern Bell Mobile Sys., 323 F.3d 32, 38 (1st Cir. 2003)). This comports with Rule 23's directive to "find[]" that common issues predominate. Fed. R. Civ. P. 23(b)(3).

C. Indicators of Market Efficiency

The most widely accepted indicators of market efficiency are the five so-called "Cammer factors," named after the case in which Judge Alfred J. Lechner, Jr. first articulated them. Cammer v. Bloom, 711 F. Supp. 1264 (D.N.J. 1989). As the First Circuit recounted in In re Xcelera.com Secs. Litig., these factors include: "(1) the stock's average trading volume; (2) the number of securities analysts that followed and reported on the stock; (3) the presence of market makers and arbitrageurs; (4) the company's eligibility to file a Form S-3 Registration Statement; and (5) a cause-and-effect relationship, over time, between unexpected corporate events or financial releases and an immediate response in stock price." 430 F.3d 503, 511 (1st Cir. 2005) (citing Cammer, 711 F. Supp. at 1286-87) (footnote omitted).[2]

The fifth factor (cause-and-effect relationship) is "in many ways, the most important," id. at 512, and was recognized in Cammer itself as "the essence of an efficient market and the foundation for the fraud on the market theory," 711 F. Supp. at

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[2] Courts have considered other factors as well, including total market capitalization, the bid-ask spread of stock quotes, and the percentage of stock not held by insiders (the "float"). See Krogman v. Sterritt, 202 F.R.D. 467, 474 (N.D. Tex. 2001); Serfaty v. International Automated Sys., Inc., 180 F.R.D. 418, 423 (D. Utah 1998); O'Neil v. Appel, 165 F.R.D. 479, 503 (W.D. Mich. 1996). The parties in this case have not addressed these additional factors; therefore, the Court makes no rulings as to their relevance or any findings relative to them.

1287. Additionally, even though R. Alan Miller ("Miller"), the lead plaintiff Thomas Thuma's ("Thuma") expert,[3] suggests that national stock exchanges (e.g., NASDAQ, AMEX, or NYSE) be presumed efficient for class certification purposes, it is generally accepted that a stock's listing on a national exchange does not, by itself, establish that the stock trades in an efficient market. Lehocky v. Tidel Techs., Inc., 220 F.R.D. 491, 505 n.15, 506 n.18 (S.D. Tex. 2004) (citing O'Neil, 165 F.R.D. at 504); Cammer, 711 F. Supp. at 1287 ("It is not logical to draw bright line tests -- such as whether a company is listed on a national exchange . . . ."); Harman v. LyphoMed, Inc., 122 F.R.D. 522, 525 (N.D. Ill. 1988). Given, however, that listing on such an exchange undisputably improves the market structure for trading in a particular stock, the Court agrees that one would be hard-pressed to deny the relevance of this fact in an efficiency analysis. See O'Neil, 165 F.R.D. at 504 ("The market system upon which a particular stock trades provides some insight . . . .").

[3] Miller earned a Bachelor of Science degree in Economics from Cornell University and a Master of Business Administration degree in Financial Accounting from the Wharton School. Affidavit of R. Alan Miller [Doc. No. 77] ("Miller Aff."), Ex. A. Miller is the President of Philadelphia Investment Banking Company. He has given in-court testimony in thirty cases and provided deposition testimony, declarations, and affidavits in numerous others. Id. ¶ 2. In securities class action cases, Miller has testified for plaintiffs "most of the time or all of the time." Transcript of Evid. Hr'g, Mar. 23, 2006 [Doc. No. 129] ("Evid. Hr'g") at 58. The Court generally credits his assertions -- as far as they go.

Miller has submitted two affidavits and testified relative to the information efficiency of PolyMedica's stock price. This evidence focuses primarily on an evaluation of the five Cammer factors. Each will be discussed briefly, as Miller's analysis on each is largely uncontested.

1. Average Trading Volume

A high average weekly volume of trades "suggests market efficiency since it implies significant investor interest in the company and a likelihood that many investors are executing trades on the basis of newly available or disseminated corporate information." Xcelera.com, 430 F.3d at 514 (internal quotation marks omitted). Weekly trading volume has been called possibly "one of the most important" of the Cammer factors. Krogman, 202 F.R.D. at 474 (citation omitted). Cammer itself cited an authority suggesting that weekly volume over 1% of total shares outstanding would warrant a "substantial presumption" of efficiency and volume over 2% a "strong presumption." Cammer, 711 F. Supp. at 1286 (citing Bromberg & Lowenfels, 4 Securities Fraud and Commodities Fraud, § 8.6 (Aug. 1988)); see also Xcelera.com, 430 F.3d at 514 (citing Cammer and approving certification of a class in which the average weekly trading volume was 4% of the total shares outstanding).

During the Contested Period, the average weekly trading volume of PolyMedica shares was 4,140,232 shares, or approximately 31% of the 13,280,000 total shares outstanding. Supp. Aff. of R. Alan Miller [Doc. No. 118] ("Supp. Miller Aff.") ¶ 4.A. Volume at this level far exceeds the 2% weekly trading volume that Cammer suggested warranted a "strong presumption" of market efficiency. PolyMedica does not dispute Miller's assessment of market volume.[4] This factor, therefore, counsels strongly in favor of a finding of market efficiency.

2. Number of Securities Analysts

"[T]he greater the number of securities analysts following and reporting on a company's stock, the greater the likelihood that information released by a company is being relied upon by investors." Xcelera.com, 430 F.3d at 514. According to one study, among the several commonly used market efficiency indicators, this Cammer factor is one of only two which actually have statistically significant, empirical support. See Brad M. Barber et al., The Fraud-on-the-Market Theory and the Indicators

[4] But see Unger v. Amedisys Inc., 401 F.3d 316, 324 (5th Cir. 2005) ("[T]rade volume can be grossly exaggerated on some exchanges through double-counting, sometimes by over fifty percent.") (citing M. Barclay & F. Torchio, A Comparison of Trading Models Used for Calculating Aggregate Damages in Securities Litigation, 64 Law & Contemp. Probs. 105, 106 (Summer 2001)).

of Common Stocks' Efficiency, 19 J. Corp. L. 285, 306, 310 (1994) (finding weekly trading volume to be the other).

The number of analysts desired for a finding of market efficiency, however, is not certain. In Xcelera.com, the First Circuit approved a finding of efficiency even though there was only a single analyst following Xcelera.com's stock. 430 F.3d at 514-15; compare Unger, 401 F.3d at 325 (vacating class certification and remanding where there were no analysts); and Krogman, 202 F.R.D. at 475 (inefficient where 0-2 analysts); and Griffin v. GK Intelligent Sys., Inc., 196 F.R.D. 298, 303 (S.D. Tex. 2000) (inefficient where no analysts); and Serfaty, 180 F.R.D. at 422 (same); O'Neil, 165 F.R.D. at 501 (finding efficiency unlikely); with Lehocky, 220 F.R.D. at 508 (finding efficiency where 0-4 analysts, but considering that factor "relatively neutral"). The First Circuit in Xcelera.com noted the argument that "news articles, press releases, television interviews and the [c]ompany's SEC filings," as well as "indirect coverage from numerous influential brokerage firms reporting on other Internet and technology stocks . . . more than made up for the lack of securities analysts." Id. at 515.

Miller represents, and PolyMedica does not dispute, that at least seven brokerage firm analysts followed the stock during the disputed class period. Supp. Miller Aff. ¶ 4.C. Moreover, Miller cites the fact that "[t]here were 348 articles mentioning PolyMedica from all sources" during the disputed class period --

"183 from major sources." Id. ¶ 4.D. Given the case law, this Cammer factor probably weighs in favor of finding market efficiency, but its strength is uncertain because there exists no coherent yardstick against which to measure it.

3. Presence of Market Makers[5]

"The existence of market makers and arbitrageurs would ensure completion of the market mechanism; these individuals would react swiftly to company news and reported financial results by buying or selling stock and driving it to a changed price level." Cammer, 711 F. Supp. at 1286-87. "A market-maker is '[o]ne who helps establish a market for securities by reporting bid-and-asked quotations' (the price a buyer will pay for a security and the price a seller will sell a security)." Xcelera.com, 430 F.3d at 515 (quoting Black's Law Dictionary [990] (8th ed. 2004)). A market-maker also "stand[s] ready to buy or sell at these publicly quoted prices." Id. (quoting Lehocky, 220 F.R.D. at 508 n.24).

Miller cites the presence of "193 market makers facilitating a market in PolyMedica stock . . . as identified by the Bloomberg system. Although many of these accounted for small numbers of shares, 27 market makers traded over a million shares each and

[5] Cammer included arbitrageurs in this factor. The role of arbitrageurs generally and in this particular case is discussed infra Part II.D.

all of the major firms participated." Supp. Miller Aff. ¶ 4.B. By comparison, the First Circuit approved of the class in Xcelera.com with a market that included twenty market markers, seven of whom traded over one million shares. 430 F.3d at 516; see also Cheney v. Cyberguard Corp., 213 F.R.D. 484, 500 (S.D. Fla. 2003) (noting approvingly the presence of fifteen to nineteen market makers); Cammer, 711 F. Supp at 1283 n.30 (noting the presence of eleven market makers).

PolyMedica does not dispute this analysis. As with the previous Cammer factor, however, there is no accepted standard by which to judge the sufficiency of the number of market makers. The Court, therefore, places little weight on this factor, but to the extent this factor is informative,[6] it counsels in favor of a finding of efficiency.

4. Eligibility to File a Form S-3 Registration Statement

[6] Doubts have been expressed about the importance of this Cammer factor. See Unger, 401 F.3d at 324 (acknowledging "growing concern that the mere number of market makers, without further analysis, has little to do with market efficiency"); Krogman, 202 F.R.D. at 476; Griffin, 196 F.R.D. at 304; Serfaty, 180 F.R.D. at 422; O'Neil, 165 F.R.D. at 502 ("[M]arket makers generally do not analyze and disseminate information about the stock that they make a market for and therefore do not contribute to the efficiency of the stock's price."); Brad M. Barber et al., supra, at 307 ("[T]he number of market makers and institutional holdings do not marginally contribute to distinguishing efficient from inefficient firms.").

"Companies permitted by the SEC to file an S-3 Registration statement, an abbreviated prospectus requiring fewer disclosures than Forms S-1 or S-2, are those that meet the $75 million market capitalization requirement and have filed reports with the SEC for twelve consecutive months." Teamsters Local 445 Freight Div. Pension Fund v. Bombarbier, Inc., No. 05 Civ. 1898(SAS), 2006 WL 2161887, at *7 (S.D.N.Y. Aug. 1, 2006) (citing 17 C.F.R. § 239.13 (2006)). "Courts have found that the SEC permits an S-3 Registration statement 'only on the premise that the stock is already traded on an open and efficient market, such that further disclosure is unnecessary.'" Id. (quoting O'Neil, 165 F.R.D. at 502; citing Krogman, 202 F.R.D. at 476; Cammer, 711 F. Supp. at 1287). Courts generally consider this factor to be "extremely important" in market efficiency determinations. Griffin, 196 F.R.D. at 304; Serfaty, 180 F.R.D. at 422; see also O'Neil, 165 F.R.D. at 502.

PolyMedica was eligible to file Form S-3 throughout the disputed period. Supp. Miller Aff. ¶ 4.F. This factor, therefore, points toward a finding of efficiency.

5. Cause-and-Effect Relationship

As for the "most important" Cammer factor, Xcelera.com, 430 F.3d at 512, Miller's analysis leaves much to be desired. His original affidavit provides a listing of the ten largest stock

price movements during the entire alleged class period, five of which occurred during the Contested Period. Miller Aff., Ex. I. The chart lists the price change in PolyMedica stock on these five days, each of which had significant news events:

- Reports of consumer complaints to government investigators (Mar. 23, 2001: 49.54% decline);
- PolyMedica's response that those reports were rumors and that it had not been contacted by any government agency (Mar. 26, 2001: 42.65% rise);
- Announcement that shares would no longer be listed on the NYSE (July 23, 2001: 29.52% decline);
- Report that PolyMedica may be indicted for Medicare and investor fraud (Aug. 6, 2001: 32.17% decline);
- PolyMedica announced that the U.S. attorney for the Southern District of Florida was conducting an investigation into one of its units (Aug. 8, 2001: 17.65% decline).

Id. Miller asserts that "this is the most important empirical evidence that information reaching the marketplace became reflected in the price of PolyMedica shares." Supp. Miller Aff. ¶ 4.G. He also presents a side-by-side comparison of movements in the PolyMedica stock price, "peer group" stock prices, and the NASDAQ index and claims that "the dramatic price increases and declines in the price of PolyMedica stock during the disputed period in response to new company-specific information were not mirrored in price movements of the NASDAQ Composite Index or the comparable company index." Id. ¶ 6 & Ex. 3.

PolyMedica's expert, Frederick C. Dunbar ("Dunbar"),[7] however, sharply critiqued Miller's analysis. In response to cross-examination by Thuma's attorney regarding the large price fluctuations noted above, Dunbar testified:

> [Y]ou went and searched for the largest price drops. That's not a scientific study. A scientific study is one where you draw a sample and then you compare a test statistic from that sample to another sample . . . . All you did was went and picked the largest stock price drops and said, oh, gee, that just shows that it's informationally efficient. You picked five days out of about 160 trading days. What you should do is look at all 160 trading days and do a scientific study to see if there's a difference between the news days and the non-news days. And if you would have done that you would have found that there wasn't any difference between them.
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> . . . .
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> [I]f you picked news days as a sample, all news days, not just the ones you self selected. I mean, you selected the few news days that would prove your point. But there's many other news days in that contested period, anywhere from 23 to 59, versus [sic] on how you want to count them. If you want to look at what the stock price reaction is on those news days versus the non-news days, you'll find that you can't say that the news days were drawn from a different sample than the non-news days. In other words, they were providing as much information to the market as the non-news days.

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[7] Dunbar earned a Bachelor of Arts in Mathematics and Economics from Reed College and a Master's degree and Ph.D. in Economics from Tufts University. Aff. of Frederick C. Dunbar [Doc. No. 125] ("Dunbar Aff."), Ex. 1. He is a Senior Vice President at National Economics Research Associates, Inc. Id. ¶ 4. Dunbar has taught mathematical economics, statistics, and econometrics at Northeastern University and served as an adjunct professor at Fordham Law School and Columbia Law School. Id. He is the author or co-author of numerous scholarly works, including two recent articles addressing the fraud-on-the-market presumption. Id. ¶ 6.

The Court finds his testimony particularly credible and informative. His responsiveness to the Court's questions was both helpful and impressive.

Evid. Hr'g at 22-23. The Court endorses this criticism. Miller's mere listing of five days on which news was released and which exhibited large price fluctuations proves nothing. Miller's only marginally useful analysis -- which he oddly labels "not a significant factor" -- is his unscientific comparison of PolyMedica Stock to the NASDAQ index. Supp. Miller Aff. ¶ 6, Ex. 3.

These proffers barely identify (let alone control for) any of the myriad variables other than news that might explain the movements in PolyMedica's stock. Cf. Lehocky, 220 F.R.D. at 506 (comparing news days with non-news days using "sophisticated statistical tests" and stating that both sides' experts agreed that "the statistical analysis must account for market and industry forces"). It is not sufficient simply to report movement on significant news days. To approach usefulness, an analysis should statistically compare all news days with all non-news days. See Kumho Tire Co., Ltd. v. Carmichael, 526 U.S. 137, 141 (1999) (explaning that an expert's testimony must be "relevant to the task at hand") (quoting Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 597 (1993)); D. Michael Risinger, Defining 'The Task at Hand': Non-Science Forensic Science After Kumho Tire Co. v. Carmichael, 57 Wash. & Lee. L. Rev. 767 (2000).

More significantly, Miller's analysis comes nowhere close to supporting empirically not only that news caused price movements, see Cammer, 711 F. Supp. at 1287 (noting the necessity of

"empirical facts"), but also that those movements were "fully" and "quicky" reflected in PolyMedica's stock price, PolyMedica, 432 F.3d at 19.[8] Nothing in Miller's analysis tends to show that all reactions to any news event were regularly complete within any given time frame, let alone "quickly." The Court, therefore, has serious doubt that Miller's analysis is even of the type that can meet the standard set forth in PolyMedica. It may be true, as Miller suggests, that one "can observe a lot just by watchin,'" Miller Aff. at ¶ 24.c, but Yogi Berra is hardly a competent expert in market efficiency.

D. Indicators of Market Inefficiency

The Court has doubts about the sufficiency of Thuma's affirmative evidence regarding PolyMedica stock's information efficiency during the Contested Period. Upon his proffered evidence standing alone, however, the Court might well have been inclined to deem such a showing sufficient for class certification purposes. It is difficult to accept that a stock

[8] Other courts evaluating the cause-and-effect factor of the Cammer analysis have had much more with which to work. See Xcelera.com, 430 F.3d at 512-14 (noting the plaintiff's "sophisticated event study" and statistical evidence); Unger, 401 F.3d at 323 n.6 (noting how expert testimony regarding market efficiency "may often benefit from statistical, economic, and mathematical analysis"); Daniel R. Fischel, Efficient Capital Markets, the Crash, and the Fraud on the Market Theory, 74 Cornell L. Rev. 907, 912 (1989) (stating that the relationship between news and stock price movements can be shown by using "widely-accepted statistical techniques").

with an average weekly trading volume of over 4,000,000 shares would not have impounded news quickly. Also, PolyMedica largely does not contest that the widely accepted Cammer factors are met in this case.

The relevant inquiry, however, is not whether trading in PolyMedica stock met the Cammer factors; rather, the test is whether its stock price was information efficient. It may be, after all, that a volume of 5 or 6 million shares was required for the price to "fully reflect[]" news within the meaning of the PolyMedica standard.

In this vein, PolyMedica offers several additional items for the Court's consideration.[9] The nature of PolyMedica's evidence is quite technical, and to appreciate it fully, it is necessary to start from the beginning.

In Basic, the Supreme Court held that a rebuttable presumption could stand in the place of proof on the element of reliance when the market was "efficient." 485 U.S. at 247-48.

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[9] The First Circuit in PolyMedica approved consideration of any evidence determined by a district court to be informative on the issue of efficiency. 432 F.3d at 18 ("Many factors bearing on the structure of the market may be relevant to the efficiency analysis, and courts have wide latitude in deciding what factors to apply in a given case, and what weight should be given to those factors."). Indeed, the basic reason that court remanded this case -- rather than order certification of a class based on Judge Keeton's unchallenged, favorable analysis of the Cammer factors -- was for this Court to evaluate PolyMedica's proffered evidence. Id. at 18-19 ("If the district court had used the definition of market efficiency that we adopt today, other factors cited by PolyMedica may have also been relevant to the efficiency analysis and may have supported a contrary finding.").

The Supreme Court noted, however, it did not specifically endorse "any particular theory of how quickly and completely publicly available information is reflected in market price." Id. at 248 n.28. Rather, it simply held that if market conditions were such that it made sense to conclude that a stock's price would reflect fraudulent misrepresentations, then it was appropriate for reliance to be presumed. This might be the case if markets are efficient. The task of defining market efficiency was left to the lower courts and was decided by the First Circuit in PolyMedica.

The First Circuit's definition of efficiency focuses the analysis on "information efficiency," or how quickly the stock price reflects all public information: "For application of the fraud-on-the-market theory, we conclude that an efficient market is one in which the market price of the stock fully reflects all publicly available information." PolyMedica, 432 F.3d at 14. The First Circuit further explained that "fully reflect" means "that market price responds so quickly to new information that ordinary investors cannot make trading profits on the basis of [publicly available] information." Id. at 19. In other words, for a market to be efficient, the response of a stock's price to news must be made completely (i.e., have reached a new equilibrium) before an "ordinary investor" can earn a trading profit based upon it. The speed with which stock prices incorporate new information depends in large part on the ability

of arbitrageurs quickly to integrate new information and move prices **within hours or even minutes.**

Information efficiency must be distinguished from fundamental value efficiency. An information efficient market need not accurately respond to information such that "market prices mirror the best possible estimates, in light of all available information, of the actual economic values of securities in terms of their expected risks and returns." Id. at 15 (quoting Lynn A. Stout, The Mechanisms of Market Inefficiency: An Introduction to the New Finance, 28 J. Corp. L. 635, 640 (2003) [hereinafter, Stout, Mechanisms]). A market that is fundamental value efficient is both information efficient and accurate in its valuation of stocks. Id. at 16. Thus, it is possible for a market to be information efficient but not fundamental value efficient. Id.

The First Circuit requires only that a market be information efficient, not fundamental value efficient. Id. Still, "as a matter of logic," evidence related to fundamental value efficiency may be relevant because fundamental value efficiency incorporates information about information efficiency. See id.; see also Stout, Mechanisms, supra, at 640-41 ("Despite the fact that information efficiency and fundamental value efficiency are distinct concepts, the two can be, and often are, made to go hand-in-hand, with fundamental value efficiency flowing naturally from informational efficiency.").

Underpinning the notion of information efficiency is the assumption that stock prices can reach a new equilibrium every time new information is released. Since there are, of course, as many assessments of news as there are traders, an increasing body of scholarship doubts whether it can ever be the case that a stock's price respond in such a way as to absolutely prevent an ordinary investor from profiting based on news.[10]

> [I]magine a highly simplified market with only one security, stock issued by Widget Corp. at $100 per share. Assume also that there are only two investors: Bull, who thinks Widget stock is worth $101, and Bear, who thinks it worth $99. In a perfect market with no risk aversion, wealth limitations, transactions costs, or restrictions on short selling, even this very modest disagreement makes an equilibrium price impossible. This is because Bull will see the chance to buy "undervalued" Widget stock as a money machine, and will buy and buy, until the supply of Widget stock is exhausted. The supply will never be exhausted, however, because Bear simultaneously sees a chance to make money by selling Widget stock short, and will borrow it, and borrow still more of it (presumably from Bull), to sell it short (again, presumably to Bull). The end result is that Bull and Bear place infinite bets against each other, and no equilibrium emerges.

Stout, Mechanisms, supra, at 642-43 (footnote omitted, emphasis added). At any point in this infinite scenario, John Q. Public

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[10] The emerging field of behavioral finance suggests that differing investor assessments of value appear to be the rule, rather than the exception. See, e.g., Stout, Mechanisms, supra, at 639-66; Frederick C. Dunbar & Dana Heller, Fraud on the Market Meets Behavioral Finance, 31 Del. J. Corp. L. 455, 483-97 (2006). Because the notion of information efficiency upon which the fraud-on-the-market presumption rests is crumbling under sustained academic scrutiny, the future of securities fraud class action litigation -- dependent on this presumption -- may be in jeopardy.

(an ordinary investor) could enter the market with his own assessment of the news upon which Bull and Bear are trading. If his assessment ultimately proves to be more accurate, he will have made a trading profit on the basis of that information.

The PolyMedica definition of "efficiency," therefore, erects a significant hurdle which plaintiffs must jump before being permitted to take advantage of the fraud-on-the market-presumption. This is perfectly appropriate since the presumption stands in the place of an important element of a securities fraud claim. Though this Court is instructed to focus on information efficiency, the First Circuit has also stated that indicators of fundamental value efficiency are relevant to a discussion of information efficiency. This Court, therefore, will tie itself to the mast of information efficiency, but loosen the bindings when considerations of fundamental value efficiency proves beneficial to the analysis. This course makes the most sense in the aftermath of the standard announced in PolyMedica.

PolyMedica's evidence seeks to show both (1) that PolyMedica's stock price during the Contested Period did not quickly and fully respond to news, and (2) that the structure of the market for PolyMedica stock was such that it could not do so. The evidence is of both the direct and indirect nature, and the Court largely credits it.

1. Indirect Evidence: Impediments to Selling Short

Again, a market is efficient when "the market price of the stock fully reflects all publicly available information." PolyMedica, 432 F.3d at 14. The First Circuit's explication of "fully reflects" is a not-so-subtle indication that its conception of market efficiency depends on professional investors' ability to complete arbitrage transactions.[11] See id. at 9-10 ("One way information gets absorbed into the market and reflected in stock price is through arbitrageurs"). Indeed, Dunbar, PolyMedica's expert, testified that arbitrage is "the mechanism by which information becomes impounded in the stock price." Evid. Hr'g at 27-28 (emphasis added). This Court rejects the assertion that arbitrage is the only mechanism of information efficiency,[12] but accepts that the significant role

[11] Most commonly, arbitrage is defined as "[t]he simultaneous buying and selling of identical securities in different markets, with the hope of profiting from the price difference in those markets." Black's Law Dictionary 112 (8th ed. 2004). "[T]rading on truly superior information," however, is also another common definition, wherein "the trader arbitrages between time periods, rather than between markets." Lynn A. Stout, Why the Law Hates Speculators: Regulation and Private Ordering in the Market for OTC Derivatives, 48 Duke L.J. 701, 738 (1999) [hereinafter, Stout, Speculators]. It is this latter sense in which the First Circuit primarily spoke in PolyMedica when distinguishing between an arbitrageur and an "ordinary investor." See 432 F.3d at 9-10.

[12] Even Dunbar later retreated from such a broad conclusion, conceding that one certainly could affect stock price through normal stock transactions: "You could but you don't affect it enough. You know, we're not saying that information wouldn't get into the price ever. It just doesn't satisfy the rapidly and quickly requirement." Evid. Hr'g at 38-39. This is in large

of arbitrageurs toward that end is widely acknowledged in academic commentary -- including sources cited by the First Circuit in PolyMedica. See, e.g., Stout, Mechanisms, supra, at 653 ("[I]nformational efficiency depends on arbitrageurs' ability to quickly move prices."); Stout, Speculators, supra, at 738.

PolyMedica offers indirect evidence that short selling PolyMedica's stock during the Contested Period was difficult. First, "[b]eginning in January 2001, PolyMedica's short interest began to skyrocket." Dunbar Aff. ¶ 26. Compared to the NASDAQ short interest average of less than 2%, the percentage of PolyMedica shares outstanding represented by the short interest rose from 7.8% at the end of 2000 to 66% in April 2001 and stayed near that level for the rest of the Contested Period. Id. ¶ 27. Second, finding shares to short became very difficult. Compared to the NASADAQ average of 1.9 trading days in the same period, the average number of days it took to cover a short sale of PolyMedica stock during the Contested Period was 10 days and at least once spiked to 20 days. Id. ¶ 28.[13]

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part because short selling is the only method by which non-owners of the stock -- "which is the majority of your traders" -- can use what information they have directly to affect the market price. Id. at 39.

[13] This data is corroborated by anecdotal evidence. See Dunbar Aff. ¶ 35.

Third, and undoubtedly related, the transaction costs for short selling PolyMedica stock became extraordinarily high. As explained by Dunbar:

> When shares are sold short, the short seller pays the broker an amount for the right to borrow the shares (the "loan fee") and also provides cash collateral for the value of the borrowed shares, which is held in an interest-bearing margin account. The difference between [the] loan fee and the rate paid to the collateral is called the "rebate rate," or the net amount that the short seller is earning on his collateral. For most stocks . . . , the loan fee is typically quite small, approximately 15 basis points per annum, so that the rebate rate is approximately equal to the market rate of interest.

Id. ¶¶ 30-31. Stocks are labeled "special" if their loan fee rises above 1% per annum, lowering the rebate rate. From April 2000 to September 2001, approximately 9% of stocks were considered "special," and less than 1% of stocks had a negative rebate rate. Id. ¶¶ 32-33. PolyMedica's loan fee during the summer of 2001, by comparison, was reported as anywhere from 15% to 35%, amply qualifying PolyMedica's stock as "special" and making it the focus of news articles and academic commentary. See id. ¶ 34. Its loan rate also became negative. Evid. Hr'g at 32.

The tangible effect of these constraints on short selling is seen in yet another piece of evidence proffered by PolyMedica: violations of put-call parity. Using derivative securities

called "puts"[14] and "calls"[15] (together, "options") in combination with short sales, arbitrageurs can make guaranteed profits if certain conditions are present. This is because any stock position has an equivalent "synthetic position" (i.e., a more complex position that involves options). For example, buying a call will entail the same risk as buying both a put and the underlying stock (assuming the put and call have the same strike price and expiration date). With the former position, losses would limited to the price paid for the call (e.g., if the stock price falls below the strike price) while the possible gains would be unlimited. Likewise with the latter position: losses would limited to the price paid for the put plus the difference between the purchase price and strike price (e.g., if the stock price were to fall below the strike price) while the possible gains would be unlimited.[16]

This suggests -- and it is true -- that there is a relationship between the price of a put and the price of an

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[14] A "put" is the right to sell a security at a certain price (the "strike price") by certain date (the "expiration date").

[15] A "call" is the right to buy a security at a certain price by a certain date.

[16] Assume a stock price of $150, a call price of $55 (strike price of $100), and a put price of $5 (strike price of $100). If one purchased a call, the most one could lose is $55 (if the stock price fell below $100). Likewise if one purchased the stock and a put, for a total of $155, if the stock price fell below $100, one could exercise the put and still suffer a loss of only $55.

equivalent call. Indeed, in an information efficient market, the following will be true:

Price of Call Option	+	Strike Price on Option	=	Price of Put Option	+	Current Price of Stock

This is known as "put-call parity." If this parity is violated, arbitrageurs can make a series of purchases and sales that will guarantee a profit.

Consider the following two scenarios:

	A	B
Current Stock Price:	$150	$150
Price of a Put (strike price of $100):	$5	$5
Price of a Call (strike price of $100):	$60	$50

In both scenarios, put-call parity is violated. In scenario A, an investor could simultaneously buy the stock and a put (total expenditure of $155) while selling a call (revenue of $60), and be assured that if the stock price dropped below the strike price (the worst-case scenario), he could exercise his option and receive $100. The profit would be $5 -- guaranteed. Likewise in scenario B. An investor could short-sell the stock and sell a put (total revenue of $155) while buying a call (expenditure of $50), and be assured that if the stock price fell below the strike price and the holder of the put exercised her option (which she would), the stockholder could exercise his call option

and cover the put for only $100. The profit again would be $5 -- guaranteed.[17]

Thus, if a disparity did not correct, an arbitrageur would be able to perform these transactions indefinitely and generate unlimited profit. In an information efficient market, disparities do correct, and there are no longer any opportunities for arbitrage profits. In scenario A, demand for both the stock and its derivative puts would increase, driving those prices up, while supply for calls would rise, driving those prices down. This would happen until put-call parity returned. In scenario B, demand for calls would increase, driving those prices up, while the supply of puts and the underlying stock would rise, driving those prices down. This likewise would happen until put-call disparity returned.

The ability of arbitraguers simultaneously to effectuate a short sale along with the options transactions is critical. Barriers to short selling inhibit this process. In the face of such restrictions, the B scenario is the predicted result in academic literature. See, e.g., Stout, Mechanisms, supra, at 646-47 (explaining how stock prices are easily overvalued in the market and that options traders, through arbitrage, can cause the price to be more accurate).

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[17] These examples ignore both the profits from temporary riskless investments during the course of the transaction and the losses from loan fees associated with short sales.

The B scenario was the case with PolyMedica stock. Dunbar submits that prior to January 1, 2001, the average violation of put-call parity in PolyMedica stock options was only 0.5%, which is consistent with the 0.3% that one study reported as average for normal stocks. Dunbar Aff. ¶ 44. During the Contested Period, however, the average put-call disparity in PolyMedica stock options rose to 3.5% -- seven times higher than previously and much higher than the study's 95th percentile cut-off of 1.95%. Id. ¶ 45. Theoretically, arbitrageurs should have effectuated trades which would have returned the market in PolyMedica stock and options to put-call parity. Dunbar suggests, however, that the barriers to short selling prevented this from happening. Id. ¶ 52.[18]

Miller responds that this whole discussion does not address information efficiency but rather something akin to fundamental value efficiency. Miller Aff. ¶¶ 11, 13, 29-30. The Court agrees that one teaching of PolyMedica's evidence relating to

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[18] Constraints on short sales may be widespread. There can be so many impediments to short selling that "short sellers have only limited influence on prices in most markets." Stout, Mechanisms, supra, at 644; see also Eli Ofek et al., Limited Arbitrage and Short Sales Restrictions: Evidence from the Options Markets (Nat'l Bureau of Econ. Research, Working Paper No. 9423, 2002), available at http://www.nber.org/papers/w9423 ("[S]hort sales restrictions exist and are not uncommon."). Though this may be true, low or nonexistent barriers to short selling are nonetheless essential to information efficiency. This Court does not need to make conclusions as to the general pervasiveness of such impediments. What matters is that in this case, the barriers to short selling in the market for PolyMedica stock in particular were uncommonly high.

short selling and put-call parity is that PolyMedica's stock price almost certainly did not reflect its fundamental value during the Contested Period.[19] Even assuming the validity of Miller's criticism, the evidence of the put-call disparity would remain very much relevant. As the First Circuit explained, fundamental value efficiency "may be relevant to the [information] efficiency determination as, for example, circumstantial evidence that arbitrageurs are not trading in the market, with the result that securities prices do not fully reflect all publicly available information." PolyMedica, 432 F.3d at 16. It is precisely this nuanced use to which PolyMedica puts this evidence. As Dunbar testified:

> [W]e have various pieces of evidence that all put together are confirmatory. There can be constraints on shorts. Right? And the constraints on shorts will prevent people who don't own the stock from providing their viewpoints to the market. So we know right there that that's going to create bias. And then for other market participants they're not seeing short activity. So that slows down the dissemination of information into the market.
>
> . . .
>
> You could [affect the stock price by buying and selling the stock directly,] but you don't affect it enough. You know, we're not saying that information wouldn't get into the price ever. It just doesn't satisfy the rapidly and quickly requirement. And the reason for that is because the people that don't own the stock, which is the majority of your traders, are not providing their information about the price of the stock. The only people who could provide information by selling the stock are the stock owners themselves.

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[19] The type of arbitrage described in this Part is the traditional, between-market type. See supra note 11.

Evid. Hr'g at 37-39. Even Miller agreed that arbitrage can help achieve market efficiency. Id. at 59. Moreover, the interrelatedness of fundamental value efficiency and information efficiency, as defined by the First Circuit, makes it impossible to ignore PolyMedica's evidence. This lends support to PolyMedica's argument that the market for its stock was not information efficient.[20]

2. Direct Evidence: Serial Correlation

Dunbar also cites direct evidence tending to show that the market for PolyMedica stock was not information efficient: the price of PolyMedica exhibited positive serial correlation. Normally, a stock's price over time "follow[s] a random pattern of changes[] known as the 'random walk.'" Dunbar Aff. ¶ 16. This "implies that past stock price returns do not have predictive power over current or future returns; that is, the returns will not be serially correlated." Id. (emphasis added). Thus, if information has been quickly and fully impounded into

[20] Miller asserts that Dunbar has not demonstrated that the put-call disparity during the Contested Period was caused by reaction to news and offers several other explanations. Supp. Miller Aff. ¶ 9. It is not PolyMedica's burden to disprove market efficiency, but rather Thuma's burden affirmatively to prove it. PolyMedica uses this evidence simply to call into question Miller's efficiency determination.

Miller also points to anomalies in and disagreements between two databases containing historical price information on options in PolyMedica stock. Id. Any large database will have errors. Far from detracting from Dunbar's conclusions, that two separate databases support his analysis makes it more robust.

the stock price, the change in stock price on any given day should be a reflection of material information released on that day only. Studies confirm that serial correlation on most stocks is not significantly different from zero. Id. ¶ 17. According to Dunbar:

> [M]ost stocks respond to news within one day. However, structural impediments in the market, such as high cost of shorting, can delay the adjustment of stock price to new information, causing the process to take place over several days or more. In such situations, because the stock does not impound the information quickly, the direction in which the price moves today is a statistically significant predictor of the direction in which it will move tomorrow; that is, the stock's returns to not follow a random walk[,] but instead[] are serially correlated.

Id. ¶ 18. At least one other court has acknowledged the usefulness of examining serial correlation in determining market efficiency. See Lehocky, 220 F.R.D. at 506 n.20 (noting that both parties' experts agreed on its helpfulness).

Performing several statistical analyses that tested for the presence of serial correlation in PolyMedica's daily returns during the Contested Period, Dunbar determined that PolyMedica's stock indeed was positively serially correlated between March 30, 2001 and August 20, 2001. Dunbar Aff. ¶¶ 37-39 & Ex. 5. Here is Dunbar's testimony under cross-examination:

> Q You're not claiming that on any particular day you can predict the next day stock price based on what happened today, are you?
> A Yes, I am.
> Q You are.
> A In terms of an expected value sense, yes.
> Q In terms of some average or statistical average, right?

A That's correct.
Q But on any given day you can't say that the stock price is going to do X because it did Y today?
A Not with certainty, just in terms of --
Q Probability.
A -- a bet that is better than a fair game bet. It's a, it's a bet that would work if I did it repeatedly. If I did it repeatedly, I know I would make money, but I don't know if I would make money on the first day.
Q Now [your colleague] said there's more than a 50 percent probability, in her affidavit. Do you recall that?
A If -- well, that's conditional probability. If, if the stock goes up today there's more than a 50, there's like a 60 percent probability it's going to go up tomorrow. If it goes down today, then there's a 60 percent probability it's going to go down tomorrow. So you can devise a profitable trading strategy on the basis of those probabilities.

Evid. Hr'g at 83-84. What this suggests is that the same forces (i.e., reaction to news) that were affecting PolyMedica's stock price on Day D were also affecting its price on Day D+1.[21]

To this court's knowledge, no court has ever definitively ruled on the acceptable time frame within which a stock's price must reflect news. At least one court appears to have accepted a two-day window. See, e.g., Lehocky, 220 F.R.D. at 506 n.19; see also Jonathan R. Macey et al., Lessons from Financial Economics: Materiality, Reliance, and Extending the Reach of Basic v. Levinson, 77 Va. L. Rev. 1017, 1031 (1991) ("[F]inancial

[21] It is true, as Dunbar acknowledged, that if a company is experiencing continuous news of one type or another (i.e., all good or all bad), its stock may appear serially correlated. As Dunbar testified, however, that he used a "large" sample of 160 trading days. Evid. Hr'g at 82-83.

economists often define the event period as the two-day period consisting of the announcement day and the following day."). This Court, however, holds that the First Circuit's definition and relevant explanation of efficiency in PolyMedica, which stated that stock price must quickly and fully reflect the release of public information such that ordinary investors cannot profitably trade on the basis of it, requires that the reaction to news be fully completed on the same trading day as its release[22] -- and perhaps even within hours or minutes. See Xcelera.com, 430 F.3d at 513 n.11 (approving a finding of market efficiency "because Plaintiffs' event study capture[d] the same-day reaction to Xcelera's stock price to company-specific events" (emphasis added)). The positive serial correlation of PolyMedica's stock price, therefore, suggests that it did not "quickly" and "fully" respond to material information during the Contested Period.

[22] Or the next trading day, if the news is released after the market has closed.

III. CONCLUSION

The Court finds that the first four Cammer factors favor a finding of market efficiency, with the factor concerning trading volume strongly indicating the propriety of such a finding. The fifth, and most important, Cammer factor presents problems to such a finding, however. Thuma's evidence indicates only that PolyMedica's stock price responded to news on the five biggest news days within the Contested Period. It does not show what it did on other news days; it does not show what it did on non-news days; and it is not a scientific analysis of the relationship between news and stock price. Moreover, the Court has doubts whether such an analysis even suffices to meet the First Circuit's "quickly" and "fully" standard articulated in PolyMedica.

Finally, the Court finds that Thuma's weak showing regarding market efficiency has been sufficiently rebutted by PolyMedica. PolyMedica's evidence suggests significant barriers to short selling, a mechanism which is both relevant to information efficiency and essential to fundamental value efficiency. Also, PolyMedica has demonstrated that its stock was serially correlated. Such a condition is fundamentally incompatible with the standard the First Circuit announced.[23]

[23] Because the Court finds the market inefficient during the Contested Period, it need not address PolyMedica's argument that the class is not ascertainable if short sellers are to be excluded. Further, the Court declines to revisit Judge Keeton's

Accordingly, Thuma's Motion to Certify Class for the Period January 1, 2001, to August 21, 2001 [Doc. No. 116] is DENIED.

SO ORDERED.

/s/ William G. Young

WILLIAM G. YOUNG
DISTRICT JUDGE

ruling with respect to the remainder of the class period in that regard, as that is law of the case and the Court is satisfied with Thuma's representations on the issue.

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